明細書

導電性微粒子、導電性微粒子の製造方法、及び、異方性導電材料 技術分野

- [0001] 本発明は、導電性微粒子、導電性微粒子の製造方法、及び、異方性導電材料に関し、詳しくは、金被膜の細孔が少な<優れた導電性を有する導電性微粒子、該導電性微粒子の製造方法、及び、該導電性微粒子を用いた異方性導電材料に関する。 背景技術
- [0002] 従来、導電性微粒子として金、銀、ニッケル等の金属粒子が用いられてきたが、比重が大きく、形状が一定でないため、バインダー樹脂中に均一に分散しないことがあり、異方性導電材料の導電性にムラを生じさせる原因となっていた。

これに対して、芯材粒子として樹脂粒子、ガラスビーズ等の非導電性粒子の表面に無電解メッキによりニッケル又はニッケルー金等の金属被膜を施した導電性微粒子が報告されている(例えば、特許文献1参照)。

特許文献1には、実質的に球状な樹脂粉末粒子を無電解メッキ法により金属被覆を 形成した導電性無電解大ソキ粉体が開示されている。

[0003] 一方、ニッケル被膜を有する導電性微粒子に金メッキを施す場合、従来、置換型無 電解金メッキが行われて(いた。

しかしながら、置換型無電解金大ノキは、下地ニッケルと金とのイオン・口傾向の差を利用した析出方法であり、メッキ浴組成は比較的単純であり管理が容易であるが、反面、下地ニッケルが被覆された時点で反応が停止するため、析出膜厚は薄くなり、かつ、下地の溶解に起因する細孔(ピンホール)が多数存在するれづ問題があった。

- [0004] このため、置換型無電解金メッキでありながら厚付けが可能な高速置換型無電解金メッキ液(例えば、特許文献2参照)や、置換及び還元が同時に起こる無電解金メッキ液(例えば、特許文献3参照)が報告されている。
 - しかしながら、これらのメッキ液を用いた方法は、ニッケル等の汚染物質に非常に敏感であり大ッキ浴の安定性にかけるれづ問題があった。
- [0006] また、通常、金メッキにはメッキ浴の安定性が優れることからシアンペロ金等を用いたシ

アン浴が用いられているが、シアン浴は強アルカッで用いられるため芯材粒子等への 浸食が強いれづ問題や、環境に有害であるれづ問題があり、ノーシアン系の無電 解金メッキが望まれていた。

特許文献::特開平8-311655 号公報

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特許文献,:特開平₄ - 37_{1 583} 号公報

発明の開示

発明が解決しようとする課題

[000.] 本発明は、上記現状に鑑み、金被膜の細孔が少な<優れた導電性を有する導電性微粒子、大ソキ浴の安定性に優れノーシアン系である該導電性微粒子の製造方法、及び、該導電性微粒子を用いた異方性導電材料を提供することを目的とする。 課題を解決するための手段

- [000] 上記目的を達成するために請求項1記載の発明は、下地ニッケル被膜の表面に無電解金メッキにより金被膜が形成された導電性微粒子であって、該導電性微粒子を、硝酸を用いて溶出試験を行ったときの、ニッケルの溶出量が30~100μg/gである導電性微粒子を提供する。
- [000·] また、請求項2 記載の発明は、下地ニッケル被膜の表面で酸心反応を起こし析出金属である金の表面では酸化反応を起こさない還元剤を下地ニッケル被膜の表面に存在させ、金塩を還元させて金を析出させる請求項1記載の導電性微粒子の製造方法を提供する。
- [000] また、請求項3記載の発明は、請求項1記載の導電性微粒子が樹脂バインダーに分散されてなる異方性導電材料を提供する。
- [00] 以下、本発明の詳細を説明する。 本発明の導電性微粒子は、下地ニッケル被膜の表面に無電解金メッキにより金被膜が形成された導電性微粒子である。
- [00元] 本発明の導電性微粒子は、ニッケル被膜を有しているものであり、芯材粒子の表面 にニッケル被膜を形成することにより得ることができる。 上記芯材粒子の材質は、適度な弾性率、弾性変形性及び復元性を有するものであ

れば、有機系材料であっても無機系材料であってもよ<特に限定されないが、樹脂粒子等の有機系材料であることが好ましい。

上記有機系材料としては、特に限定されず、例えば、フェノール樹脂、アミノ樹脂、ポリエステル樹脂、尿素樹脂、メラミン樹脂、エポキシ樹脂、ジビニルベンゼン重合体;ジビニルベンゼンースチレン共重合体、ジビニルベンゼンー(メタ)アクリル酸 エステル共重合体等のジビニルベンゼン系重合体;(メタ)アクリル酸 エステル重合体等が挙げられる。上記(メタ)アクリル酸 エステル重合体は、必要に応じて架橋型、非架橋型いずれを用いてもよく、これらを混合して用いてもよい。なかでも、ジビニルベンゼン系重合体、(メタ)アクリル酸エステル系重合体が好ましく用いられる。ここで、(メ列アクリル酸エステルとはメタクリル酸エステル又はアクリル酸エステルを意味する。上記無機系材料としては、例えば、金属、ガラス、セラミックス、金属酸心物、金属ケイ酸塩、金属炭心物、金属窒心物、金属炭酸塩、金属硫酸塩、金属リン酸塩、金属

これらの芯材粒子は、単独で用いられてもよく、2種類以上が併用されてもよい。

硫心物、金属酸塩、金属ハロゲン心物、炭素等が挙げられる。

- [0012] 芯材粒子の表面にニッケル被膜を形成する方法としては、特に限定されず、例えば、無電解大ソキ、電気大ソキ、溶融メッキ、蒸着等の方法が挙げられる。芯材粒子が樹脂粒子等の非導電性である場合は、無電解メッキにより形成する方法が好適に用いられる。
- [0013] 芯材粒子の表面にニッケル被膜が形成された粒子としては、通常の分散手法により水中に懸濁させることができるものであればその形状は特に限定されるものではなく、例えば、球状、繊維状、中空状、針状等の特定の形状を持った粒子でもよく、不定形状の粒子であってもよい。なかでも、良好な電気的接続を得るために芯材粒子の表面にニッケル被膜が形成された粒子は球状が好ましい。
- [0014] 芯材粒子の表面 にニッケル被膜が形成された粒子の粒径は、特に限定されるものではないが、1 ~1 00μ mが好ましく、2 ~20 μ mがより好ましい。
- [0015] 本発明の導電性微粒子は、上記ニッケル被膜を下地として、その表面に無電解金メッキにより金被膜が形成されたものであり、導電性微粒子を、硝酸を用いて溶出試験を行ったときの、ニッケルの溶出量が $3.0 \sim 1.00 \mu \, \mathrm{g/g}$ であることが必要である。

- [0016] 本発明の導電性微粒子を、硝酸を用いて溶出試験を行ったときの、ニッケルの溶出量が $3.0 \sim 1.00 \mu$ g/gであれば、無電解金大y+により形成された金被覆に、下地ニッケル被覆の溶解に起因する細孔(ピンホール)が殆ど無い導電性微粒子を得ることができる。従って、金被膜の細孔が少ないため、優れた導電性を有する導電性微粒子となる。
- [0017] 本発明において、硝酸を用いた溶出試験は、金メッキが施された導電性微粒子を、1 重量%の硝酸溶液に15分間浸漬し溶出したニッケル量を中和滴定により測定する方法により行っことができる。具体的には、例えば試料1gを1重量%の硝酸溶液に浸漬し、溶解したニッケルを中和滴定によりニッケル溶解量を調べることにより行っことができる。
- [0018] ニッケル被膜の表面に無電解金メッキにより金被膜を形成する方法としては、ニッケルの溶出量が30~100μg/gとなる方法であれば特に限定されないが、金被膜の細孔を少なくすることができるため、例えば、下地触媒型の還元型無電解金大ツキによる方法が好適に用いられる。また、下地触媒型の還元型無電解金メッキによる方法に加えて、例えば、自己触媒型の還元型無電解金メッキによる方法、及び置換型無電解金メッキによる方法の少なくともいずれかの方法を併用してもよい。
- [0019] 上記の、下地触媒型の還元型無電解金大yキによる方法は、下地二ッケル被膜の表面で酸⁴¹反応を起こし析出金属である金の表面では酸化反応を起こさない還元剤を下地二ッケル被膜の表面に存在させ、金塩を還元させて金を析出させることにより金被膜を形成する方法である。
- [000 0] 上記の、下地触媒型の還元型無電解金大ソキによれば、置換型無電解金大ソキのよっに、溶出した下地ニッケルイオンにより大ソキ浴が汚染されることがなく、また、自己触媒型の還元型無電解金メッキのよっに、メッキ浴中に金が分解析出することがなく、メッキ浴の安定性は良好となる。
- [00²1] 上記金塩としては、特に限定されず、例えばパくたu(CN)₂等のシアンパ金、NaAuC 1 *2HO等の塩パ金ナトリウム、塩パ金酸等のハロゲンパ金塩、亜硫酸金等のノー シアン系金塩等が挙げられる。

上記ノーシアン系金塩を用いることにより、ノーシアン系の無電解金メッキを行っことが

でき、シアン浴のように強アルカリで用いられることがないため芯材粒子等への浸食がなく、環境にも配慮したものとなる。上記ノーシアン系金塩のなかでも、良好な金メッキ被膜が形成できることから塩ペロ金ナトリウム、塩化金酸等の塩化金塩が好ましい。

[0022] 従って、本発明の導電性微粒子の製造方法は、下地ニッケル被膜の表面で酸心反応を起こし析出金属である金の表面では酸心反応を起こさない還元剤を下地ニッケル被膜の表面に存在させ、塩心金ナトリウムを還元させて金を析出させることが好ましい。

上記の、導電性微粒子の製造方法もまた、本発明の一つである。

[0023] 次に、下地触媒型の還元型無電解金大ソキの具体的な方法について説明する。 上記の、下地触媒型の還元型無電解金大ソキによる方法は、下地であるニッケル被膜のニッケルを触媒として金メッキ被膜を析出させる方法である。

下地を触媒として いる金 火ノキ方法のため、一度金メッキが施された部位には金大ノキ が施されないれづことから非常に均一で一定の金大ノキ膜厚を有する導電性微粒子 を得ることができる。

[0024] 下地であるニッケル被膜としては、例えば、純ニッケル金属被膜だけでなく、ニッケル - リン合金被膜、ニッケル・ホウ素合金被膜等が挙げられる。

また、上記=yケル=ホウ素合金被膜のホウ素含有量としては、特に限定されなしが、0.5 ~3重量%が好ましい。

[0025] 下地触媒型の還元型無電解金メッキ浴としては、例えば、塩心金塩を基本とするメッキ浴に錯心剤としてチオ硫酸塩、還元剤として亜硫酸塩、及び、緩衝剤としてリン酸水素アンモニウムが添加された大ッキ浴等が挙げられる。更に、上記メッキ浴にヒドロキシルアミンが添加されたメッキ浴はより均一な金析出が可能なことからより好適に用いられる。

上記チオ硫酸塩のなかでも、チオ硫酸アンモニウムが好ましい、。また、上記亜硫酸塩のなかでも、亜硫酸アンモニウムが好ま<u>い</u>、。

[0026] 上記メッキ浴中の塩~□金塩の濃度は、0.01~0.1mol/Lが好ましく、0.01~0.

O3mol/Lがより好ましい。

上記メッキ浴中の錯い剤としてチオ硫酸塩の濃度は、0.08 ~0.8mol/Lが好ましく、0.08 ~0.24mol/Lがより好ましい。

上記メッキ浴中の還元剤として亜硫酸塩の濃度は、0.3 ~2.4mol/Lが好ましく、0.3 ~1mol/Lがより好ましい。

上記メッキ浴中の、金析出を安定させるヒドロキシルアミンの濃度は、0.1 ~0.3 mol/ /Lが好ましく、0.1 ~0.15 mol/ Lがより好ましい。

[0027] また、上記メッキ浴中の、pHを調整するためのpH調整剤としては、例えば、アルカッ性側に調整する場合は水酸ペナトリウム、アンモニア等が挙げられ、なかでも、水酸ペナトリウムが好ましく、酸性側に調整する場合は硫酸、塩酸等が挙げられ、なかでも、硫酸が好ましい。

上記メッキ浴のpHは、反応駆動力を高めるため高い方がよく、8~10が好ましい。

- [0028] 更に、上記メッキ浴の浴温は、反応駆動力を高めるため高い方がよいが、高過ぎると 浴分解が起こることがあるため、50~70℃が好ましい。
- [0029] また、上記メッキ浴は、水溶液中に粒子が均一に分散していないと反応による凝集が生じ易くなるため、粒子を均一に分散させ、凝集を生じさせないよっに超音波及び撹 絆機の少なくともいずれかを用いて分散させることが好ましい。
- [003 0] 更に、上記のように物理的な方法で凝集を抑制するだけでなく、心学的に凝集を抑制するために、ポリエチレングリコール等の界面活性剤を併用することがより好ましい、
- [0031] 本発明の異方性導電材料は、上述した本発明の導電性微粒子が樹脂バインダーに 分散されてなるものである。
- [0032] 上記異方性導電材料としては、本発明の導電性微粒子が樹脂バインダーに分散されていれば特に限定されるものではなく、例えば、異方性導電ペースト、異方性導電インク、異方性導電粘接着剤、異方性導電フィルム、異方性導電シート等が挙げられる。
- [0033] 本発明の異方性導電材料の作製方法としては、特に限定されるものではないが、例 えば、絶縁性の樹脂バインダー中に本発明の導電性微粒子を添加し、均一に混合し

て分散させ、例えば、異方性導電ペースト、異方性導電インク、異方性導電粘接着 剤等とする方法や、絶縁性の樹脂バインダー中に本発明の導電性微粒子を添加し、 均一に混合して導電性組成物を作製した後、この導電性組成物を必要に応じて有 機溶媒中に均一に溶解(分散)させるか、又は加熱溶融させて、離型紙や離型フィル ム等の離型材の離型処理面に所定のフィルム厚さとなるように塗工し、必要に応じて 乾燥や冷却等を行って、例えば、異方性導電フィルム、異方性導電シート等とする方 法等が挙げられ、作製しようとする異方性導電

材料の種類に対応して、適宜の作製方法をとればよい。また、絶縁性の樹脂バインダーと、本発明の導電性微粒子とを、混合することなく、別々に用いて異方性導電材料としてもよい。

- [0034] 上記絶縁性の樹脂バインダーの樹脂としては、特に限定されるものではないが、例えば、酢酸ビニル系樹脂、塩ベビニル系樹脂、アクリル系樹脂、スチレン系樹脂等のビニル系樹脂;ポリオレフィン系樹脂、エチレン一酢酸ビニル共重合体、ポリアミド系樹脂等の熱可塑性樹脂;エポキシ系樹脂、ウレタン系樹脂、ポリイミド系樹脂、不飽和ポリエステル系樹脂及びこれらの硬化剤からなる硬化性樹脂;スチレンーブタジェンースチレンブロック共重合体、スチレンーイソプレンースチレンブロック共重合体、これらの水素添加物等の熱可塑性ブロック共重合体;スチレンーブタジェン共重合ゴム、クロロプレンゴム、アクリロニトリルースチレンブロック共重合ゴム等のエラストマー類(ゴム類)等が挙げられる。これらの樹脂は、単独で用いられてもよいし、2種以上が併用されてもよい。また、上記硬化性樹脂は、常温硬ベロ型、熱硬ベロ型、光硬ベロ型、湿気硬で型等のいずれの硬ベロ形態であってもよい。
- [0035] 本発明の異方性導電材料には、絶縁性の樹脂バインダー、及び、本発明の導電性微粒子に加えるに、本発明の課題達成を阻害しない範囲で必要に応じて、例えば、増量剤、軟心剤(可塑剤)、粘接着性向上剤、酸心防止剤(老心防止剤)、熱安定剤、光安定剤、紫外線吸収剤、着色剤、難燃剤、有機溶媒等の各種添加剤の1種又は2種以上が併用されてもよい。

発明の効果

[0036] 本発明の導電性微粒子は、上述の構成よりなるので、金被膜の細孔が少な<優れた

導電性を有するものを得ることが可能となった。また、本発明の導電性微粒子の製造方法は、金被膜の細孔が少なく優れた導電性を有する導電性微粒子を、メッキ浴の安定性に優れノーシアン系で得ることが可能となった。更に、本発明の導電性微粒子を用いた異方性導電材料は、優れた導電性を有するものとなった。

発明を実施するための最良の形態

- [0037] 以下、実施例を挙げて本発明をより詳しく説明する。なお、本発明は以下の実施例に限定されるものではない。
- [0038] (実施例1)

粒径 4μ mのジビニルベンゼン系重合体樹脂粒子(積水 4π 学工業社製)を、イオン吸着剤の10重量%溶液で5分間処理し、その後、硫酸パラジウム0.01重量%水溶液で5分間処理し、更にジメチルアミンボランを加えて還元処理を施し、濾過、洗浄し、ニッケルメッキ液に浸して反応させることにより、ニッケル大ツキが施された微粒子を得た。

- [0039] 次に、塩化金ナトリウム1 Qgとイオン交換水1000mLとを含む溶液を調整し、得られたニッケルメッキが施された微粒子10gを混合して水性懸濁液を調整した。
 - 得られた水性懸濁液に、チオ硫酸アンモニウム30g、亜硫酸アンモニウム8 Qg、及び、リン酸水素アンモニウム4 Qgを投入しメッキ液を調製した。
 - 得られたメッキ液にヒドロキシルアミン10gを投入後、アンモニアを用いpHを10に合わせ、浴温を60Cにし、15~20分程度反応させることにより金被覆が形成された導電性微粒子を得た。
- [0040] 得られた導電性微粒子を1重量%の硝酸溶液に15分間浸潰し、溶出したニッケル量を中和滴定により測定して、硝酸を用いた溶出試験を行った結果、ニッケルの溶出量は52 μg/gであった。
- [0041] (実施例2)

実施例1で得られたニッケルメッキが施された微粒子に、塩 $^{-1}$ 金酸16gとイオン交換水1000mLとを含む溶液を調製し、得られたニッケルメッキが施された微粒子10gを混合して水性懸濁液を調製した。

得られた水性懸濁液に、チオ硫酸アンモニウム30g、亜硫酸アンモニウム8 Qg、及び

、リン酸水素アンモニウム40gを投入しメッキ液を調製した。得られたメッキ液にアミノピリジン5gを投入後、アンモニアを用いpH7に合わせ、浴温を6 0℃にし、15 ~2 0分程度反応させることにより金被覆が形成された導電性微粒子を得た。

[0042] 得られた導電性微粒子を1重量%の硝酸溶液に15分間浸潰し、溶出したニッケル量を中和滴定により測定して、硝酸を用いた溶出試験を行った結果、ニッケルの溶出量は52μg/gであった。

[0043] (比較例1)

実施例1と同様にして、ニッケル大ノキが施された微粒子を得た。

次に、シアンペロ金カリウム7gとイオン交換水1000mLとを含む溶液を調製し、得られたニッケルメッキが施された微粒子1 Qgを混合して水性懸濁液を調製した。

得 られた水性懸濁液 に、EDTA・4Na3 Qs、及び、クエン酸 一水和物2 Qgを投入しメッキ液を調製した。

得られたメッキ液を、アンモニアでpHを5.5に合わせ、浴温を70℃にし、20~30分程度反応させることにより、置換金大ンキで金被覆が形成された導電性微粒子を得た。

[0044] 得られた導電性微粒子を、実施例1と同様にして、硝酸を用いた溶出試験を行った 結果、ニッケルの溶出量は213 μg/gであった。

[0045] (実施例3)

樹脂バインダーの樹脂としてエポキシ樹脂 (油化シェルエポキシ社製、 エピコート82 8 $^{\perp}$) 100重量部、トリスジメチルアミノエチルフェノール2重量部、及び、トルエン100 重量部に、実施例1で得られた導電性微粒子を添加し、遊星式撹絆機を用いて充分に混合した後、離型フィルム上に乾燥後の厚さが 7μ mとなるように塗布し、トルエンを蒸発させて導電性微粒子を含有する接着フィルムを得た。なお、導電性微粒子の配合量は、フィルム中の含有量が $5万個/cm^2$ とした。

その後、導電性微粒子を含有する接着フィルムを、導電性微粒子を含有させずに得た接着フィルムと常温で貼り合わせ厚さ 17μ mで2層構造の異方性導電フィルムを得た。

[0046] (比較例2)

比較例1で得られた導電性微粒子を添加したこと以外は実施例3と同様にして異方性導電フィルムを得た。

[0047] (異方性導電材料の導電性評価)

得られた異方性導電フィルムを 5×5 mmの大きさに切断した。また、一方に抵抗測定用の引き回し線を持つ、幅 200μ m、長さ1mm、高さ 0.2μ m、L/ $S20\mu$ mのアルミニウム電極が形成されたガラス基板を2枚用意した。異方性導電フィルムを一方のガラス基板のほぼ中央に貼り付けた後、他方のガラス基板を異方性導電フィルムが貼り付けられたガラス基板の電極パターンと重なるように位置あわせをして貼り合わせた。

2枚のガラス基板を、圧力1^{ON、}温度18 0Cの条件で熱圧着した後、電極間の抵抗値を測定した。実施例3、比較例2で得られた異方性導電フィルムについてそれぞれ測定した。

また、作製した試験片に対してPCT試験(8 OC、95%RHの高温高湿環境下で1 00 O時間保持)を行った後、電極間の抵抗値を測定した。

評価結果を表1に示す。

[0048] [表 1]

	電極間の抵抗値 ^(党) (通常)	電極間の抵抗値(の) (PCT試験後) (8 0 ⁻ C、9 5%RH、「000時間後)	評価
実施例3	2.7	6. 2	О
比較例2	^r 2.3	32. г	Х

[0049] 表1より、実施例1で得られた導電性微粒子を用いた実施例3の異方性導電フィルムは、比較例1で得られた導電性微粒子を用いた比較例2の異方性導電フィルムに比べ、接続抵抗値が低い。また、PCT試験後の、抵抗値の上昇の度合いは、実施例3のほうが比較例2に比べて低い。低い抵抗値の要因は、金メッキ被膜の細孔が少ないためと考えられる。

産業上の利用可能性

[0050] 本発明によれば、金被膜の細孔が少な<優れた導電性を有する導電性微粒子、メソ

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キ浴の安定性に優れノーシアン系である該導電性微粒子の製造方法、及び、該導電性微粒子を用いた異方性導電材料を提供することができる。

請求の範囲

- [1] 下地ニッケル被膜の表面に無電解金メッキにより金被膜が形成された導電性微粒子であって、
 - 該導電性微粒子を、硝酸を用いて溶出試験を行ったときの、ニッケルの溶出量が30~ 100μ g/gである
 - ことを特徴とする導電性微粒子。
- [2] 下地ニッケル被膜の表面で酸化反応を起こし析出金属である金の表面では酸 中反応を起こさない還元剤を下地ニッケル被膜の表面に存在させ、金塩を還元させて金を析出させることを特徴とする請求項1記載の導電性微粒子の製造方法。
- [3] 請求項1記載の導電性微粒子が樹脂バインダーに分散されてなることを特徴とする 異方性導電材料。

INTERNATIONAL SEARCH REPORT

In tarnkmonal applickmon No.

PCT/JP2005/013090

A. CLASSIFICATION OF SUBJECT MATTER #01B5/00 (2006.01), #021B/74 (2006.01), #01B13/00 (2006.01), #22F1/02 (2006.01), #023C18/31 (2006.01), #023C18/44 (2006.01), #01B11/01 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC #10B5/00 (2006.01), #10B13/22 (2006.01), #10B13/30 (2006.01), #22F1/02 #10B5/00 (2006.01), #10B13/22 (2006.01), #10B13/30 (2006.01), #22F1/02 #10B000 (2006.01), #10B13/22 (2006.01), #10B13/30 (2006.01), #22F1/02 #10B000 (2006.01), #10B13/22 (2006.01), #10B13/30 (2006.01), #10B13/101 (2006.01) Documentation searched other than mainimum documentation to the extent that such documen, are included #10B fields searched Jitsuyo Shinan Koho 1971-2005 To-oku Jitsuyo Shinan Koho 1995-2005 #10B000 (2006.01), #10B13/20 (2006.01), #10B13/30 (2006.01), #10B13/101 (2006.01) Electronic declaration of the mainimum documentation to the extent that such document, with indication, where appropriate, of the relevant passages #10B000 (2006.01), #10B13/20 (2006			101/012	303/013030		
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国際調査報告

A. 発明の属する分野の分類(国際特許分類(IPC))

Int.Cl. 7 H01B5/00 (2006. 01), H01B1/22 (2006. 01), H01B13/00 (2006. 01), B22F1/02 (2006. 01), C23C18/31 (12006. 01), C23C18/44 (2006. 01), H01R1I/01 (2006. 01)

B. 調査を行った分野

調査を行った最小限資料 (国際特許分類 (IPC))

lnt Cl. 7 HOIBS/00 (2006. 01), H01B1/22 (2006. 01), H01B13/00 (2006. 01), B22F1/02 (2006. 01), C23C18/31 (2006. 01), C23 O 8/44 (2006. 01), H01R11/01 (2006. 01)

最小限資料以外の資料で調査を行った分野に含まれるもっ

日本 国実用新案公報日本 国公開実用新案公報

1922-1996年1971-2005年

日本 国实用新案登録公報

1996-2005年

日本国登録実用新案公報

1994-2005年

国際調査で使用した電子データペース (データベースの名称、調査に使用した用語)

WPI/L

C. 関連すると認められる文献

引用文献の カテゴ y - ォ	引用文献名 及び一部の箇所が関連する t きは、その関連する箇所の表示	関連 する 請求の範囲の番号
Y	JP 2004-111163 A 積水化学工業株式会社) 2004.04. 08 [特許請求の範囲]、【0004】、[0020] - [0024】 (ファミッ	1, 3
A		2
Y	JP 8-311655 A (日本化学工業株式会社)1996.11.26 [特許請求の範囲] (ファミリーなし)	1 、 3
A		2

$\mathbf{r} = \mathbf{C} \boldsymbol{\eta}_{m{i}} D$ 続きにも文献が列挙されている。

円 パテントファミ;- に関する別紙を参照。

ネ 引用文献のカテゴリー

- TA J 特に関連のある文献ではなく、一般的技術水準を示す もの
- IE」 国際 出願 日前の出願または特許であるが、国際 出願 日 以後 に公表されたもの
- 「L」優先権主張に疑義を提起する文献又は他の文献の発行 日若 しくは他の特別な理由を確立するために引用す る文献 (理由を付す)
- 「oj ロ頭による開示、使用、展示等に言及する文献
- TP J 国際出願日前で、かつ優先権の主張の基礎となる出願

- の日の役に公表された文献
- IT」国際出願日又は優先日後に公表された文献であって 出願 t 矛盾するものではなく、発明の原理又は理論 の理解のために引用するもの
- 「X」特に関連のある文献であって、当議文献のみで発明 の新規性又は進歩性がない t 考えられるもの
- 「Y」特に関連のある文献であって、当該文献と他の1以 上の文献との、当業者にとって自明である組合せに よって進歩性がないと考えられるもの
- r&j 同一パテント7 ァミ y 文献

国際調査を完了した日

10.11.2005

国際調査報告の発送日

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国際調査機関の名称及びあて先

日本国特許庁 (1SA/ JP) 郵便番号100-8915 東京都千代田区霞が関三丁目4番3号

特許庁審査官 (権限のある職員)

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電話番号 0:3-3581-1101 内線 3477